



Study of d_0 Significance Cuts in SECVTX

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 $Z \rightarrow b\bar{b}$ Meeting

- ❖ When forming a vertex, the scale of $L_{xy}/\sigma_{L_{xy}}$ is given by the scale of the d_0/σ_{d_0} cuts applied
- ❖ Want to study dependence of tag and mistag rates as a function of d_0/σ_{d_0} cuts for pass 1 and pass 2 of SECVTX.
- ❖ Want to be able to loosen up purity restriction for more efficiency for $Z \rightarrow b\bar{b}$
- ❖ With looser d_0/σ_{d_0} cuts, we wish to loosen the $L_{xy}/\sigma_{L_{xy}}$ cuts in order to use other distinguishing information, such as the mass of the secondary vertex in a multivariate tagger with higher efficiency

- ❖ Signal estimation: realistic HERWIG top and $Z \rightarrow b\bar{b}$ MC, following b-tagging prescription for 4.9.0
- ❖ Background estimation: JET 100 data (thanks to Natalia for help!):
`/cdf/data55/top/btag/data/jets/gqcd3f*.dat`
- ❖ Have also used realistic HERWIG $Z \rightarrow q\bar{q}$ for *preliminary* background estimation
- ❖ Used 4.9.0 + 4.7.1 data prescription for processing data, beam hist code = 13
- ❖ Used 4.9.0 prescription for processing MC, beam hist code = 17
- ❖ Set $L_{xy}/\sigma_{L_{xy}}$ cut to 0
- ❖ Varied d_0/σ_{d_0} for pass 1 and pass 2

- ❖ Fiducial jet: $E_T > 15 \text{ GeV}$, $|\eta| < 2.0$ (defaults)
- ❖ Taggable jet: fiducial jet with at least 2 good tracks
- ❖ Tagged jet: taggable jet with $L_{xy}/\sigma_{L_{xy}} > 3.0$
- ❖ Mistagged jet: taggable jet with $L_{xy}/\sigma_{L_{xy}} < -3.0$

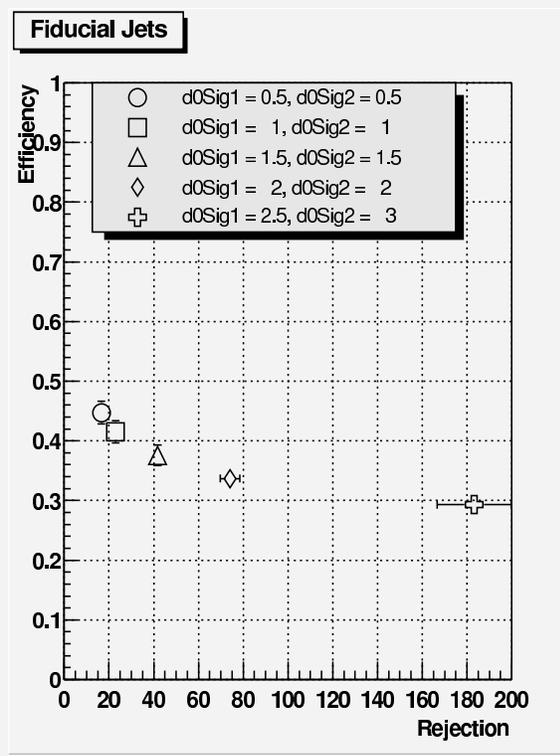
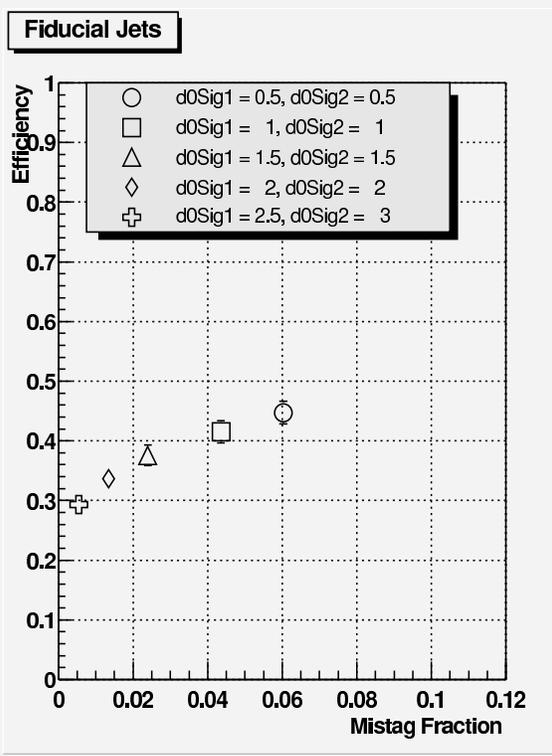
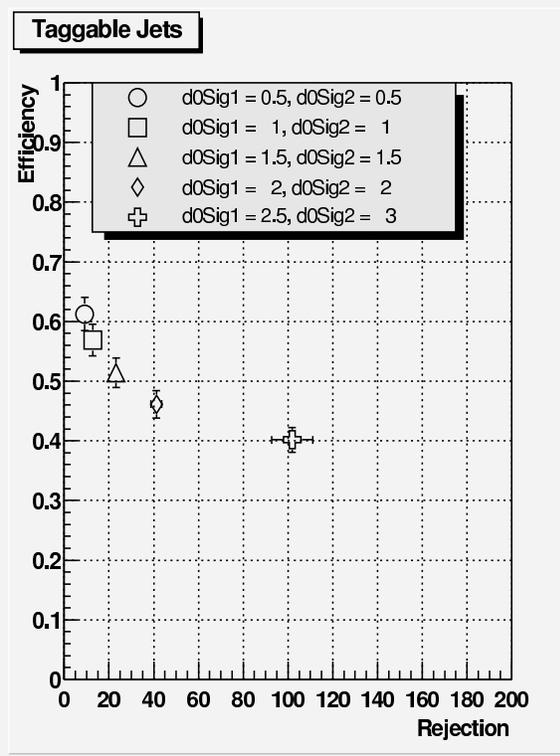
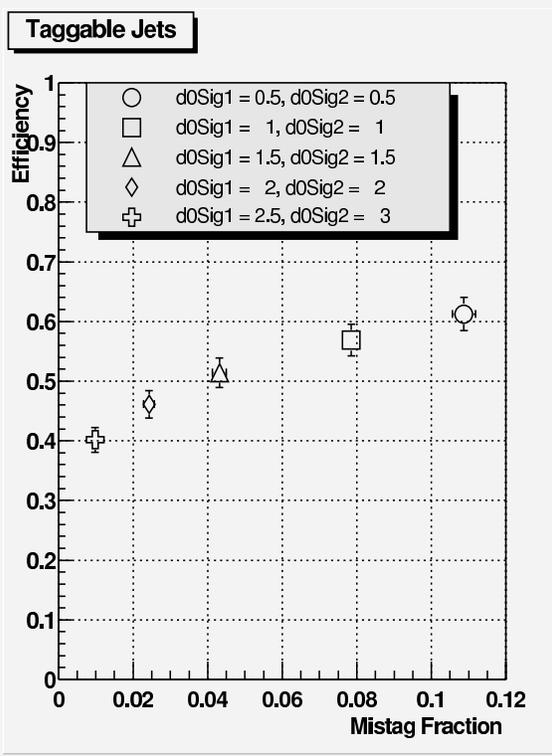
$$\epsilon_{taggable} = \frac{N_{tag}^{MC}}{N_{taggable}^{MC}} \quad (1)$$

$$\epsilon_{fiducial} = \frac{N_{tag}^{MC}}{N_{fiducial}^{MC}} \quad (2)$$

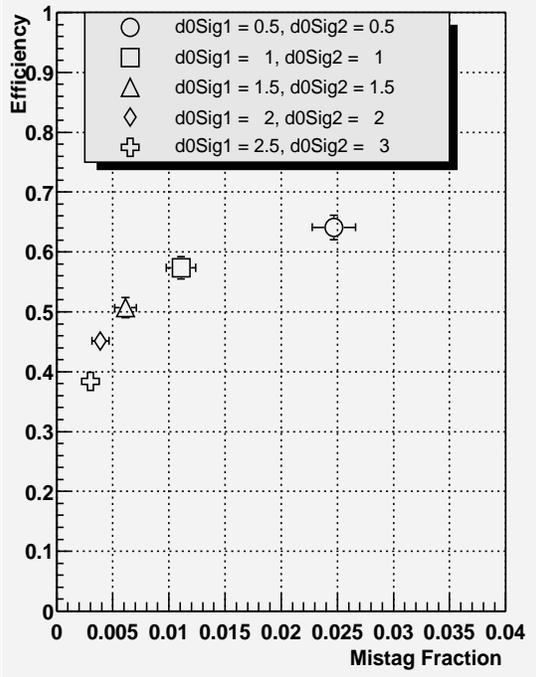
$$m_{taggable} = \frac{N_{mistag}^{DATA}}{N_{taggable}^{DATA}} \quad (3)$$

$$m_{fiducial} = \frac{N_{mistag}^{DATA}}{N_{fiducial}^{DATA}} \quad (4)$$

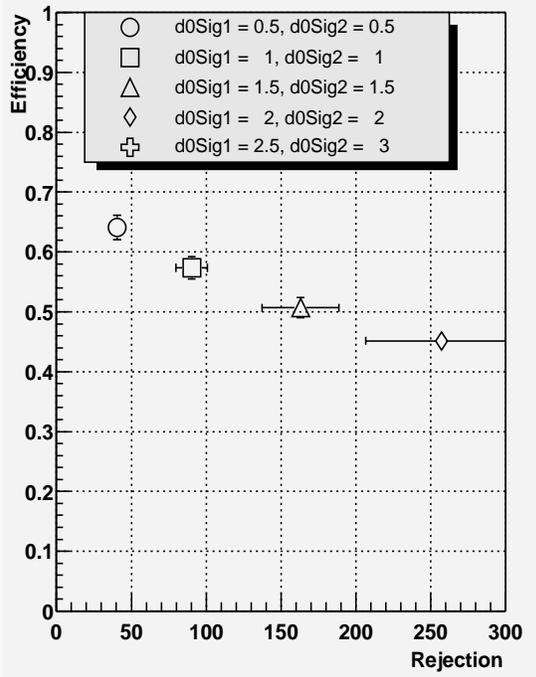
$$R = 1.0/m \quad (5)$$



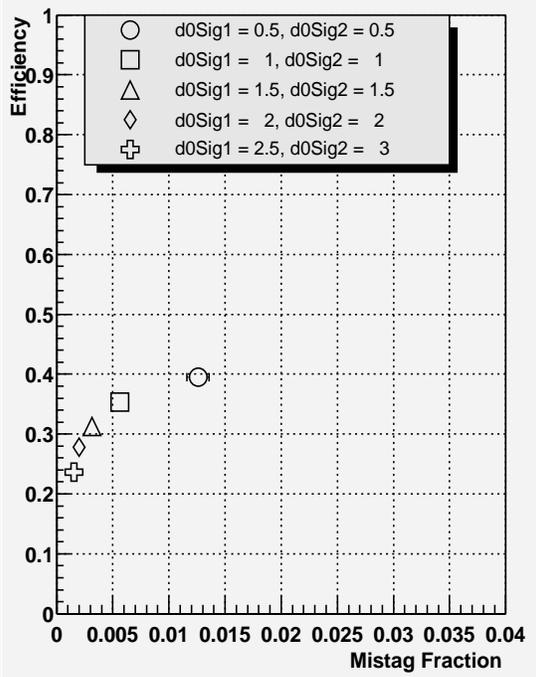
Taggable Jets



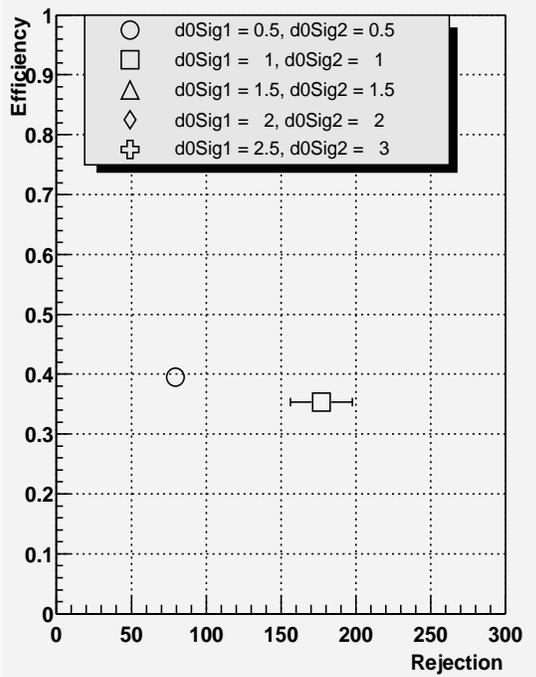
Taggable Jets



Fiducial Jets



Fiducial Jets



- ❖ Need to understand the large discrepancy between the two background estimations
- ❖ Possible cause: Using two different production releases (4.7.1 for data, 4.9.0 for MC)
- ❖ Seeing different N_{hit} distributions.
- ❖ Need to re-process data with 4.8.4.
- ❖ Data mistag estimation is the answer, $Z \rightarrow x\bar{x}b\bar{a}q$ is just a first guess
- ❖ Once this is understood, try to include mass information to increase efficiency

